

Newspaper Clips
January 2-4, 2016

January 2

Business Line ND 02/01/2016 P-15

IIT-K, Japanese experts sign MoU to work on smart cities

INDO-ASIAN NEWS SERVICE

Kolkata, January 1

The Indian Institute of Technology-Kharagpur on Friday inked a deal with Japan's Nikken Sekkei Research Institute (NSRI) to plan, design, and implement smart technologies to develop sustainable habitats for India's smart city growth.

IIT-K's Ranbir and Chitra Gupta School of Infrastructure Design and Management (RCGSIDM), in association with the department of architecture and regional planning (ARP), has picked up the challenge to re-address the dimensions of smart city growth based on twin concerns: sustainable infrastructure and liveable habitat, officials said.



Under the Memorandum of Understanding signed on Friday, collaborative projects such as bullet train, other smart transportation technologies and smart agriculture will be brought in. "This MoU targets design, planning and imple-

mentation of such projects and technologies for sustainable cities. Japan has the expertise in smart technologies and we are banking on our cultural history to take the relationship forward," said IIT-K director Partha Pratim Chakrabarti.

PLACEMENT PROGRESS REPORT

Core Becomes Cool as Make in India Bug Bites IITians

Students prefer core companies over fat pay packages offered by non-core ones this time

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New Delhi: The Make in India campaign dominated the first phase of placement season at the leading Indian Institutes of Technology (IITs) in the country. Prime Minister Narendra Modi's initiative along with the efforts of the institutes to give core companies early slots coupled with a conscious choice made by students to pick core companies over fat pay packages offered by non-core ones ended up with more engineering students joining core companies this year.

At IIT-Delhi, for instance, about 510 students of the 850 who took the placements this year preferred core companies compared with last year's 350 students who joined such organisations. What's more, four of the eight students at IIT-Delhi who got crore-plus salary offers from international companies opted to work for companies in India, mostly in the core sector.

This year, for the first time, two IITs — Bombay and Roorkee — pushed core companies to early slots. So far, most of the engineering institutes used to give early slots on the basis of the size of pay packages. "The higher the salary offer, the better the slot, but this year we decided to change this," said professor NP Padhy, IIT-Roorkee's placement-in-charge. It has received 225 core job offers so far compared to 150 till December last year.

Many core sector companies visited campuses for the first time this year.

Sponsoring Recruits for Higher Studies >> 11

Sponsoring Recruits for Higher Studies >> 11

Leap Year

Make in India impact at IITs: Core companies popular in first phase of placements



IIT Delhi
Over 500 offers from core companies. Four out of eight students rejected international offers to opt for roles in India, mainly to work in core sector

IIT-Bombay
Out of about 1,000 offers, 461 were from core companies compared to 300 offers a year ago

IIT-Kanpur
Of the total 950 offers, 570 were from 210 core companies

IIT-Kharagpur
400 offers from 65 core companies in phase 1 this time compared to 300 offers from 21 core companies in the previous year

IIT-Roorkee
225 offers from core companies this time compared to 150 offers till Dec a year ago

Students are surely bitten by the Make in India bug. Core cos are popular this placement season with almost 60% of them opting for core

PROF SHASHI MATHUR, Professor-in-charge for training & placement, IIT-Delhi

The remuneration in the core sectors initially may seem less but evens out in the long run. We are seeing many students investing their initial time at core companies

PROF SUDHIR KUMAR BARAI, Head of Career Development Centre, IIT-Kharagpur

Companies Ready to Sponsor Recruits for Higher Studies

>> From Page 1

At IIT-Kharagpur, companies such as Bajaj Auto, Mercedes Benz Research and Development, Wrig Nanosystems, Rolls-Royce India and Toyo Engineering Corporation made their debut visits.

While at IIT-Bombay, core companies including Triveni Turbines, Sony Energy Devices Corporation and KLA Tenor visited for the first time. General Motors, Godrej, AppDynamics, Mercedes-Benz, Bajaj Auto, Escorts Group were some of the key recruiters who came for the first time to the Kanpur campus.

"Students are surely bitten by the Make in India bug, as one can see from the kind of offers they are accepting. Core companies are popular this placement season with almost 60% of them opting for core," said IIT-Delhi's professor-in-charge for training and placement Shashi Mathur. The institute also tried to sensitise students about core companies instead of jumping at big offers from non-core ones which did not provide good job profiles.

This time, the institute also

spoke to core companies about sponsoring students for higher studies after a year or two of their joining. "Most core companies are ready to sponsor students for higher studies," said Mathur.

Typically, it is the size of the pay packets that help students to decide on a job offer. Traditionally, consulting, finance, technology and e-commerce companies form majority of the companies that come on Day 1 and offer upwards of ₹20 lakh per annum.

Professor Sudhir Kumar Barai, head of Career Development Centre at IIT-Kharagpur, said, "The remuneration in the core sectors initially may seem less but evens out in the long run. We are seeing many students investing their initial time at core companies." Last year, in the entire placement season till May, a total of over 80 core firms visited IIT-Bombay, while this time (in only a month), in the first phase of placement, over 90 core firms have paid a visit. "We are expecting more core firms to visit in the second phase," said a person in the placement cell. The jump in the number of core compa-

nies visiting this IIT is likely to be over 40% over last year. The salaries offered by core companies range anywhere between Rs 7 lakh and Rs 15 lakh per annum.

"We have promoted core firms and tech core firms this year as we have upgraded their slots for recruitment. For instance, Tata Steel, Airbus came on Day 1 and made 20 offers, and students have shown great response," said a person at IIT-Bombay placement cell. Students at IIT-Kharagpur received about 400 offers from core companies in phase 1 against 300 last year. The number of core companies also jumped from 21 last year to 65 this year.

At IIT-Kharagpur, five students from the department of Aerospace Engineering gave the Day 1 placement a miss. "All 5 of them got placed in core function of aerospace in Airbus, Honeywell and Rolls-Royce," said Barai.

Komal Kumari, one among the five students who got placed in a core company, said, "I was at one point swayed by lucrative prospects of non-core offers. I tried preparing for consultancy, but in less

than two days I was sure that I would never get the same amount of satisfaction in this job as I would in a core job." Core companies such as Bajaj Auto, Mercedes Benz Research and Development, Kepler Cannon came for the first time among other core firms.

IIT-Kanpur received the highest offers of 570 from core companies this time from 210 companies. "This year, we had specifically focused on a few industry segments like automobile, and consequently there has been a 100% rise in number of firms from this sector compared to last year," said a person at the IIT-Kanpur placement cell. "Make in India dovetails perfectly with our goals, future expansion plans are being aligned as per this initiative, thereby promoting the national agenda of infrastructure development, 100 smart cities and housing for all by 2022. Infusing fresh talent from Indian engineering campuses will ensure a robust mix of millennials to balance our experienced engineering talent base," said Rachna Mukherjee, chief human resources officer, Schneider Electric India.

IISC Students on Climate Change Action

<http://news.niticentral.com/2016/01/01/iisc-students-on-climate-change-action/>

Bengaluru, Dec 31 (PTI) Union Environment Minister Prakash Javadekar today said the government will surely think of banning use of phosphate in detergents when there was an alternative to do so.”

The professor here has given a very good idea.

He said why should we use phosphate in detergents when an alternative already exists which is cost-effective; is a better technology and which is clear ..,” he said in an interaction with Indian Institute of Science (IISc) students at a seminar on Climate Change here.”

Why not? We can definitely think of banning use of phosphate in detergents,” he said.

Javadekar said he would take up the issue with the officials of concerned department and see what best practices could be put to use in making phosphate-free detergents.”

I will definitely take this issue with the officials of the concerned department.

We will consider, and see what best practices can be (followed to make phosphate-free detergents),” he added.

Earlier, speaking after inaugurating ‘Adamyta Chetana Seva Utsav-2015-16’ here, Javdekar said that to realise Prime Minister Narendra Modi’s slogan ‘Clean India, Green India’, Environment Ministry has decided to make environment a people’s movement.

Calling the Bengaluru lakes “treasure of Bengaluru”, he said they have to be restored to its optimum efficiency.”

Therefore we will do yet another comprehensive review in the month of February of all lakes- conservation, preservation and improvement of all lakes in Bengaluru.

Central government will also help,” Javdekar said.”

With the help of state government, corporation and other bodies along with people we will make our lakes, our environment clean.

Clean lakes, clean Bengaluru will contribute to clean India, green India,” he added.

Adamyta Chetana is a voluntary organisation working in the field of social development run by Union Minister Ananth Kumar and his wife Tejaswini.

January 3

Hindustan Times ND 03/01/2016

P-01

PMO pushes plan to set up 10 pvt varsities

Brajesh Kumar

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NEW DELHI: Education in India could turn the page to a new chapter with the prime minister's office asking the human resource development ministry to fast-track a plan to set up 10 private autonomous universities for research and innovation.

The move could pave the way for world-class private institutions for higher studies to come up in the country.

These institutes, unlike the current lot of private universities regulated by the University Grant Commission, will be free of government control and have their own curriculum and fees. They will have full autonomy in hiring faculty and all other aspects of administration, sources said.

On the lines of Stanford and Princeton universities in the US, these universities will provide students modern infrastructure for research and innovation in different fields, including information and technology, medicine, agriculture and biotechnology.

"The directive from the PMO is being deliberated in the ministry and we could soon come out with a framework to set up such universities," an HRD

THE PERFECT 10

Like Stanford and Princeton, the proposed private universities will

- Have modern infrastructure for research and innovation in fields like IT, medicine, agriculture
- Be independent of govt and UGC regulations
- Have total autonomy in all aspects, including fee structure, curriculum, faculty appointments and administration
- Need huge investment to build and maintain state-of-the-art infrastructure

ministry official said.

But another official said there was no clarity on how this could be achieved.

"If these are set up through an act of Parliament such as institutes of national importance, including AIIMS, IITs or NITs, the government will have to pass separate bills for each university. Again, if they come into existence by modifying the UGC act, they will have to follow the regulatory body's guidelines," he said.

CONTINUED ON PAGE 6

PMO pushes plan to set up 10 pvt varsities

The proof of the pudding would be known, according to former UGC member MM Ansari, when private players come on board because building and maintaining state-of-the-art education facilities involve huge investment while "the return is uncertain".

At present, there are four categories of universities — central, state, deemed and private — set up through government legislations and regulated by UGC guidelines.

While central universities have been formed through an act passed by Parliament, deemed universities are recognised by the UGC if they fulfill certain conditions. State and private universities are formed by state legislations.

Institutes of national importance, established through a central act, enjoy autonomy but the HRD ministry has overall control over them.

The UGC would have no say on private universities to be set up under the directive of the PMO, sources said.

A similar attempt by the UPA government to bring the Universities for Research and Innovation Bill in 2012 could not succeed. It was rejected by the standing committee.

मेक इन इंडिया } फाइनेंस व ई कॉमर्स की बजाय कोर सेक्टर की कंपनियों को तवज्जो

आईआईटी छात्र दुकरा रहे मोटा पैकेज

नई दिल्ली @ पत्रिका . प्रधानमंत्री मोदी की महत्वाकांक्षी योजना मेक इन इंडिया का देश के प्रमुख प्रौद्योगिकी संस्थानों (आईआईटी) में चल रहे प्लेसमेंट सीजन के पहले चरण में खासा प्रभाव रहा। इन संस्थानों में ज्यादातर छात्र करिअर के लिए कोर सेक्टर की कंपनियों को तवज्जो दे रहे हैं। कई छात्रों ने कंसलटेंसी, फाइनेंस और ई कॉमर्स जैसे अन्य क्षेत्रों की कंपनियों के मोटे पैकेज को दुकराकर इन कंपनियों को चुना है। इस साल आईआईटी दिल्ली के कुल 850 छात्रों में से 510 छात्रों ने कोर सेक्टर की कंपनियों को चुना। पिछले साल यह संख्या 350 तक ही सीमित थी। इन कंपनियों को चुनने का एक और बड़ा कारण यह भी है कि इस बार ये कंपनियां उनकी उच्च शिक्षा के लिए स्पॉन्सर करने के लिए भी तैयार थीं।



1 करोड़ दुकरा 7 से 15 लाख का पैकेज चुना

आईआईटी दिल्ली के आठ में से चार छात्रों को अंतरराष्ट्रीय कंपनियों से एक करोड़ रुपए सालाना से ज्यादा का पैकेज ऑफर हुआ था, लेकिन उन्होंने उसे दुकराते हुए कोर सेक्टर की कंपनियों के साथ भारत में काम करना पसंद किया। ये कंपनियां सालाना 7 से 15 लाख का पैकेज ऑफर कर रही हैं।

60 फीसदी छात्रों ने कोर सेक्टर को चुना

जिस तरह के ऑफर्स छात्र स्वीकार कर रहे हैं उससे तो यही लगता है कि छात्र विशिष्ट रूप से मेक इन इंडिया से प्रभावित हैं। इस प्लेसमेंट सीजन में कोर कंपनियों का बोलबाला रहा। करीब 60 फीसदी छात्रों ने कोर सेक्टर की कंपनियों को चुना है।
शशि माथुर, प्रोफेसर (प्लेसमेंट इन चार्ज) आईआईटी दिल्ली

पहले पैकेज के आधार पर कंपनियों को देते थे स्लॉट, इस बार बदलाव

इस साल आईआईटी बॉम्बे और आईआईटी रूड़की ने कोर सेक्टर कंपनियों को प्लेसमेंट सीजन के शुरूआती स्लॉट में जगह दी। ज्यादातर इंजिनियरिंग इंस्टीट्यूट्स सैलरी पैकेज के आधार पर कंपनियों को स्लॉट

ऑफर करते हैं। आईआईटी रूड़की के प्रोफेसर और प्लेसमेंट इनचार्ज एन. पी. पाटी का कहना है, जितना ज्यादा सैलरी पैकेज का ऑफर, कंपनियों को उतना ही ज्यादा अच्छे स्लॉट। लेकिन इस साल हमने इसमें बदलाव किया है।

ये कोर कंपनियां हुई शामिल

आईआईटी खड़गपुर में बजाज ऑटो, मर्सडीज बेंज रिसर्च एंड डवलपमेंट, रिग नैनोसिस्टम्स, रोल्स रॉयस इंडिया और टोयो इंजिनियरिंग कॉर्पोरेशन जैसी कंपनियां पहली बार शामिल हुईं

थीं। वहीं आईआईटी बॉम्बे के प्लेसमेंट सीजन में त्रिवेणी टबाइन्स, सोनी एनर्जी डेवाइसेज कॉर्पोरेशन और केएलए टैकर जैसी कोर सेक्टर की कंपनियां शामिल हुईं।

Sunday Standard ND 03.01.2016 P-09

Of Cauliflowers and Cabbages

OPINION | A JAYAKRISHNAN



Jayakrishnan is a professor at IIT Madras and former VC of Kerala University

The suicide of a 14-year-old boy attending school and undergoing coaching classes in Kota, Rajasthan, has shocked many. It is reported that he was the 30th victim of coaching centres in this small town this year, which is better known for its entrance coaching hell holes. This is a wakeup call for not just parents who aspire their wards to secure admission into IITs and other premier institutions, but also for the nation as the higher education system in India has not evolved any concrete methods over the years for identifying creme de la creme among its youth.

Age 14 or 15 is not when one really knows one's talents and aptitudes, and often parents determine what their

wards have to accomplish in their lives. It's peer and parental pressure to succeed that has driven many to take the extreme step in their blossoming age and this is what we are witnessing in Kota.

Admission of their ward to an IIT is a dream of many parents. Since the number of seats in IITs are limited to about 10,000, there is stiff competition in securing it. Only around 1 per cent of the 1.5 million aspirants finally make it.

The criteria of admission to IITs have changed over the years. Till 2012, there was only one entrance examination, the IIT-JEE (Joint Entrance Examination) that one had to qualify. Since then, multiple filters have been introduced to identify top talent. Now, there is JEE (Advanced) in addition to JEE (Main). Also, 40 per cent weightage is given to Class XII marks, forcing aspirants to do well in board exams too—which translates to triple pressure on them.

There are reports that the JEE in 2017 could have a new avatar in the form

of an aptitude test in the place of JEE (Main). The Ashok Misra committee has proposed this to evaluate the 'scientific mettle and innovative thinking' of the aspirants with a hope to bring down the influence of coaching centres.

Another proposal is of introducing a

TO CURTAIL THE BLOSSOMING OF COACHING CENTRES AND TO DE-STRESS STUDENTS, REDUCE THE WEIGHTAGE GIVEN TO ENTRANCE TESTS SUCH AS JEE (ADVANCED).

written exam after the JEE (Advanced) to determine the 'actual capabilities and subject-wise knowledge of aspirants'. If introduced, cracking the exams will become more difficult. Such untested, half-baked proposals are nothing short of experimenting with the lives of the youth in this country. The introduction

of JEE (Advanced) as well as factoring the Class XII marks were intended to stem the influence of coaching centres, but it's business as usual for them.

If we are genuinely interested in curtailing coaching centres and de-stressing students, we should reduce the weightage given to these entrance tests. Bring this down to, say, 25 per cent from the present 60 per cent and increase the weightage of Class XII marks to 75 per cent. It will also give a boost to the importance of school education.

The possibility of a 'subject of aptitude' as optional or elective in Class XII can be thought of to determine the aptitude of students interested in pursuing engineering, science or medicine. The 25 per cent weightage in the entrance exam shall be on verbal, quantitative and reasoning skills since the student has already been examined for his or her ability in subjects of interest.

Mark Twain said 'a cauliflower is nothing but a cabbage with college education'. The Indian higher education system has been turning cabbages into cauliflowers with its mindless policies of experimenting with the youth. It is time we realised our folly. drjk.sct@gmail.com

Business Standard ND 03/01/2016 P-03

Naik heads IIM-A search panel to select his successor

BS REPORTER

Ahmedabad, 2 January

With L&T Group's Executive Chairman A M Naik stepping down as chairman of its board of governors, the Indian Institute of Management, Ahmedabad (IIM-A) has set up a search committee to fill the post.

According to institute sources, a four-member search committee, headed by Naik, comprising other board members — Sanjay Lalbhai (CMD, Arvind Ltd), Pankaj Patel (CMD, Cadila Healthcare Ltd) and D Shivakumar (Chairman & CEO, India Region, Pepsico India Holdings) — has been set up.

IIM-A, in an official communique, said Naik would continue in the position till a new chairman is identified. The search committee is likely to come up with shortlisted candidates within three months, it has been learnt. While a

revised memorandum of association (MoA) empowers IIM-A's Board to set up a search committee and come up with names of potential candidates, institute sources said the final appointment would be made by the ministry of human resource and development (MHRD).

In his resignation letter to the ministry, Naik had cited time constraints as the reason for his decision. In 2012, Naik took over from Vijaypat Singhania of Raymond Group as chairman for a three-year term, and was re-appointed for another three years early this year. During his first tenure, Naik had been instrumental in bringing Harvard Law School's Ashish Nanda to IIM-A as its first overseas director. Later, Naik also played a key role in bringing another senior Harvard faculty Srikant Datar on IIM-A's Board.

January 4

IIT Roorkee begins new year by expelling 3 students for attendance backlog

<http://www.pagalguys.com/articles/iit-roorkee-begins-new-year-by-expelling-3-students-for-atte-38468108>

IIT Roorkee expelled three students in the first-year bachelor programme on January 1, 2016. The reason cited was the failure to fulfil minimum attendance requirement of 75%. These three students will now be barred from attempting their exams. Earlier, last year IIT Roorkee had expelled 73 students from the first year for scoring less than 5 point grade in CGPA. But after the intervention by parents and directions from the High Court, IIT Roorkee re-admitted these students on certain conditions. The basic requirement was a minimum of 75% attendance in each course.

The aforementioned students, two of whom belong to Polymer Science and Engineering department and the other from Electrical Engineering department had previously been expelled along with 70 other students for scoring below the 5 point grade CGPA. IIT Roorkee re-admitted these students by enforcing the conditions that these students should pass every course in the semester, but most important of all, they must maintain 75% attendance for each course. The failure to do so has invited wrath from the institute.

Arvindra Meena of Polymer Science and Engineer, whose name has been struck off the roll call said, "We were warned before our re-admission about the strict attendance but, I was unwell for a period of time, which is why I couldn't attend classes. Since it is a holiday for the institute on the weekends I will meet our professor on Monday. I hope that he will understand my situation."

PaGaLGuY has a copy of the notice that was issued to the students. On conversation with Prof. Pramod A, Dean of Academic affairs, PaGaLGuY was told that the students had approached the institute for an appeal, but there will be no reconsideration in the decision. No sort of concessions, even on medical grounds, will be given any further to these students.

These 3 students have now been rusticated from IIT Roorkee, and their fate hangs in a balance.

IIM-A sets up search committee for new Chairman

Four-member search panel, headed by AM Naik, comprises Arvind Ltd's Sanjay Lalbhai, Cadila's Pankaj Patel and Pepsico India's D Shivakumar

http://www.business-standard.com/article/current-affairs/iim-a-sets-up-search-committee-for-new-chairman-116010200269_1.html

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Meanwhile, commenting on Naik's resignation, Nanda said, "Mr. Naik initiated many exciting initiatives at IIM-A and has been a bulwark of support and encouragement to the institute. We are grateful for his stewardship and appreciative of his legacy."

Pankaj Patel appointed as Chairman of IIM Udaipur

<http://udaipurtimes.com/pankaj-patel-appointed-as-chairman-of-iim-udaipur/>

Pankaj Ramanbhai Patel, who currently serves as the Chairman and Managing Director of the pharmaceutical giant Zydus Cadila, has been appointed as the Chairman of IIM Udaipur. The Ministry of Human Resources and Development, Govt. of India made the appointment earlier this week.

Mr. Patel, who holds a masters degree in Pharma and Pharmaceutical Technology from Gujarat University and a Law degree from University of Mumbai, is widely known as one of the most successful and innovative Indian pharma entrepreneurs.

He has been serving as the Senior Vice President of FICCI since December 2015 and President of Gujarat Chamber of Commerce & Industry since 2006. He has also been on Leadership positions in multiple pharmaceutical companies like Cipla, DialforHealth and BAAP Diagnostics. He was awarded as "Pharma Man of the Year" by the Federation of Indian Industry and Economists in 2004.

IIM Udaipur is delighted to have a person of this stature as its Chairman and it hopes to benefit from Mr. Patel's experience to achieve greater accomplishments.

State to have tie-up with IIT, BITS

<http://www.thehindu.com/news/national/andhra-pradesh/state-to-have-tieup-with-iit-bits/article8062764.ece>

The Telangana Government has decided to avail the services of experts in IIT and BITS here to overcome technical issues that would crop up in the implementation of Mission Kakatiya, the programme taken up for revival and restoration of minor irrigation tanks and major irrigation projects.

Minister for Irrigation T. Harish Rao told the officials of the department during a video conference held from the Secretariat on Sunday to utilise the services of expertise available in IIT and BITS. He directed Principal Secretary S.K. Joshi to talk to the two premier technological institutions for having a formal tie-up with them.

Reviewing the progress of Mission Kakatiya with officials in Adilabad, Karimnagar, Medak, Nizamabad, Ranga Reddy, Warangal, Mahabubnagar, Nalgonda and Khammam districts, the Minister directed them to complete all works taken up in the first phase by March 31. He told the quality control engineers to inspect the completed works before giving closure reports and clear the bill only after completion of entire work.

Asking the engineers to prepare a time schedule for the second phase works of Mission Kakaitya, the Minister also wanted them to prepare estimates for 50 per cent of the tanks to be taken up under second phase by January 15 and estimates for all proposed works by January-end.

It was further decided to fill vacant posts of Superintending Engineers at Nizamabad and Mahabubnagar and Executive Engineers at Jagityal, Mancherial, Nagarkurnool and Eturunagaram.

Stating that appointment of Assistant Executive Engineers for the department would be completed by the Public Service Commission in the next 15 days, the Minister asked the officials to handover responsibilities to them with a brief training.

Mr. Harish Rao told the engineers to form village-level committees for protection and maintenance of tanks restored/revived under phase one and taken up soil test of the silt in the tanks proposed to be taken up under phase two. He noted that only 20 tanks were being taken up in every Assembly constituency in the second phase.

Engineer-in-Chief C. Muralidhar, Project Director G. Malsur, Minor Irrigation Chief Engineers B. Nagender Rao and K. Suresh Kumar also participated in the video conference.

IIT-M: designer alloys by chemical reactions

Clusters of gold and silver react spontaneously to make alloy clusters

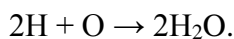
<http://www.thehindu.com/sci-tech/iitm-designer-alloys-by-chemical-reactions/article8058592.ece>

Nothing whatsoever will happen if large chunks of silver and gold kept in proximity even for infinite period. But the same cannot be said when the two metals are at nanoscale.

A path-breaking work by a team led by Prof. T. Pradeep, Department of Chemistry, IIT Madras has shown that two nanoscale pieces of metals react spontaneously at room temperature even in solution to make new alloys of well-defined composition. The study was published recently in the *Journal of American Chemical Society* (JACS).

“This means that metals with well-defined properties may be created in solution, just by chemical reactions. From a scientific perspective, this study shows that nanoparticles are similar to molecules and reactions between them can be written like chemical reactions:

$A + B \rightarrow C + D$. This is a big step forward in the chemistry of nanomaterials,” said Prof. Pradeep. “So far we wrote such reactions only with organic and inorganic molecules, as:



Alloys are made mostly by heating the constituents, often to high temperatures. But in this case, the researchers have been able to make alloys in solution at room temperature with precise composition control, to the extent that each atom is controlled.

The team of researchers led by Prof. Pradeep has shown that nanometre-sized particles or clusters of gold and silver react spontaneously in solution at room temperature to make alloy clusters of precise structure and composition.

“Metal clusters comprise a few atoms of matter and are very different from their bulk powders. Reactions happen between clusters and not between bulk powders of gold and silver. This is because nanomaterials are ‘metastable’ and are more reactive than their bulk counterparts,” he said.

As a result, clusters of gold and silver produce new alloys when in solution. The clusters of gold (Au) and silver (Ag) used in the study were Au₂₅ and Ag₄₄. These are precise molecules composed of 25 atoms of gold and 44 atoms of silver respectively, and are under 2 nanometres in diameter.

A chemical reaction between Au₂₅ and Ag₄₄ in solution will give rise to alloys of AgAu and AuAg composition. The reaction can be represented as:



In this case, the reaction products are alloys of precise composition. “The final composition of the product will depend on the composition of the reactants. So more of Ag and less of Au will give rise to an alloy of Ag type,” Prof. Pradeep explained.

Such reactions may be made to happen to make alloys of many different metals such as platinum, palladium, iridium, nickel, etc. and new materials may be made, all in solution, at room temperature.

“The excitement in nanotechnology is due to the unusual properties of materials when sizes of particles reduce to nanometres. This happens because of ‘electronic confinement’ — an effect when electron motion is limited to extremely short distances, of the order of nanometres,” he said.

This kind of reactions would mean that metallurgical processes may be done differently tomorrow. “Many nanoscale materials have new properties which are useful in catalysis. They could be luminescent or magnetic. Designer alloys with new properties may be made by these reactions,” he added.